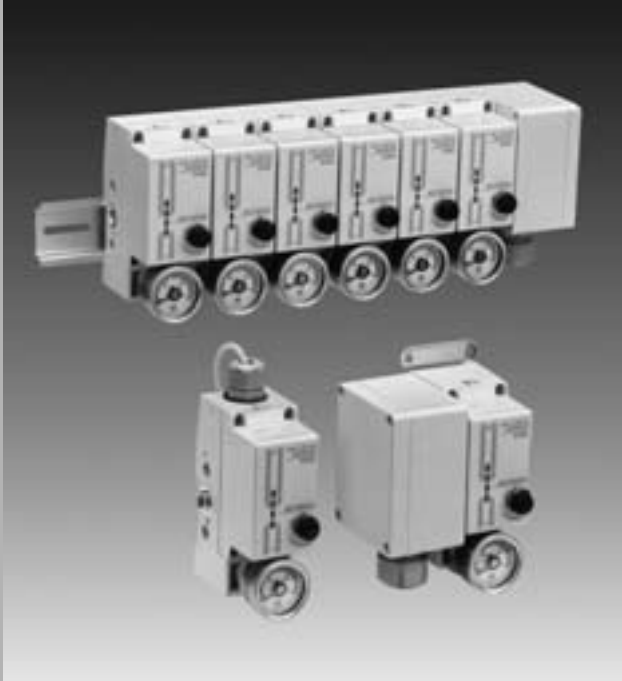


# Air Catch Sensor

## Series ISA

For Workpiece Placement Confirmation



**No-contact sensor for confirming workpiece placement, with a configuration that is less affected by supply pressure change.**

ZSE  
ISE

ZSP

PS

**ISA**

PSE

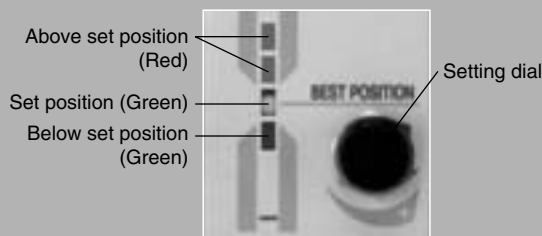
IS

ISG

ZSM

### Easy-to-set-up LED level meter

Proper set position is steadily and easily set due to the LED level meter and setting dial.



### Compliant with manifolds of up to 6 stations

Compliant with centralized wiring and piping

### Free mounting position

Stable detection is available at any mounting position due to the pressure sensor.

### Wide adjustment range

Compliant between 10 and 300  $\mu\text{m}$

### Stably detects 10 $\mu\text{m}$ clearance

The configuration is unlikely to be affected by supply pressure change due to the air pressure bridge circuit and semi-conductor pressure sensor.

### IP66-compliant

Dustproof and dripproof type



# Air Catch Sensor Series *ISA*

## How to Order

### Individual wiring/Centralized wiring

ISA   -     - 01  

#### Output specifications

|    |                           |
|----|---------------------------|
| 11 | NPT open collector output |
| 15 | PNP open collector output |

#### Option

|       |                    |
|-------|--------------------|
| Nil * | DIN rail compliant |
| B     | With bracket       |
| G     | With gauge         |

\* DIN rail must be ordered separately.

Stations 1 to 6

#### Wiring specifications

|     |  |
|-----|--|
| Nil | Individual wiring (Without terminal block BOX)           |
| L   | Centralized wiring (With terminal block BOX, left side)  |
| R   | Centralized wiring (With terminal block BOX, right side) |

Ex. 1) NPN output, 4 stations, centralized wiring terminal block BOX (left), with bracket and gauge

**ISA11-4L-01BG**

Ex. 2) PNP output, individual wiring, with gauge

**ISA15-1-01G**

ZSE  
ISE

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ISA

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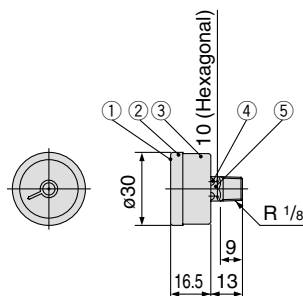
ISG

ZSM

## Accessory

- Bracket: ISA-1-A
- Gauge: G33-3-01
- DIN rail: ISA-2-1 to 7

- Gauge: G33-3-01

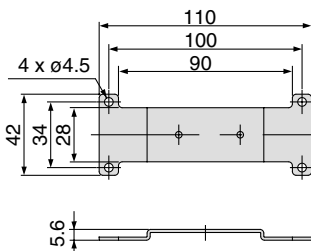


#### Description

| No. | Description               | Material        |
|-----|---------------------------|-----------------|
| 1   | Cover glass               | glass           |
| 2   | Outer frame               | Stainless steel |
| 3   | Inner frame               | Stainless steel |
| 4   | Round head Phillips screw | Stainless steel |
| 5   | Socket                    | Brass           |

- Bracket: ISA-1-A

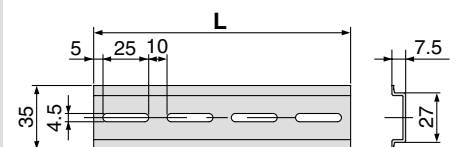
Material: SPC  
(Nickel plated)



\* Each part order comes with two M3 x 8 tapping screws.

- DIN rail: ISA-2-1 to 7

Material: Aluminum

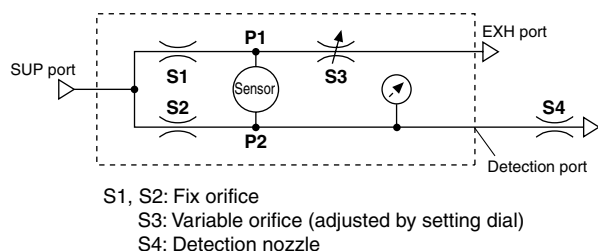


| Part no. | L   | Applicable model  |
|----------|-----|---|
| ISA-2-1  | 105 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -1  |
| ISA-2-2  | 140 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -2 · ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -1 <sub>R</sub> <sup>L</sup> |
| ISA-2-3  | 175 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -3 · ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -2 <sub>R</sub> <sup>L</sup> |
| ISA-2-4  | 210 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -4 · ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -3 <sub>R</sub> <sup>L</sup> |
| ISA-2-5  | 245 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -5 · ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -4 <sub>R</sub> <sup>L</sup> |
| ISA-2-6  | 280 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -6 · ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -5 <sub>R</sub> <sup>L</sup> |
| ISA-2-7  | 315 | ISA <span style="border: 1px solid black; padding: 0 2px;"> </span> -6 <sub>R</sub> <sup>L</sup>  |

## Specifications

|   |                 |  |
|---|-----------------|--|
| Fluid   |                 | Dry air (filtered to 5 $\mu\text{m}$ )   |
| Operating pressure range                            |                 | 0.05 to 0.2 MPa  |
| Recommended pressure range                          |                 | 0.1 to 0.2 MPa   |
| Detection distance range                            |                 | 10 to 300 $\mu\text{m}$  |
| Repeatability including temperature characteristics |                 | $\pm 10 \mu\text{m}$ (0 to 60°C (standard 25°C))   |
| Hysteresis  |                 | 10 $\mu\text{m}$ or less (Detection distance: 10 to 150 $\mu\text{m}$ )  |
| Detection nozzle O.D.                               |                 | $\phi 1.0$ standard (Refer to page 820 for data when the nozzle diameter is modified.)   |
| Display function                                    |                 | Operating indicator light (Lights ON), Deviation level indicator light   |
| Power supply voltage                                |                 | 12 to 24 VDC $\pm 10\%$ , Ripple (p-p) 10% or less (With power supply polarity protection)   |
| Current consumption                                 |                 | 30 mA or less (Output ON, All LEDs ON)   |
| Switch output                                       | ISA11           | NPN open collector: 30 V, 80 mA or less  |
|   | ISA15           | PNP open collector: 80 mA or less  |
| Operating temperature range                         |                 | 0 to 60°C (No condensation)  |
| Operating humidity range                            |                 | 35 to 85 % RH (No condensation)  |
| Noise resistance                                    |                 | 1000 Vp-p, Pulse width 1 $\mu\text{s}$ , Rise time 1 ns  |
| Withstand voltage                                   |                 | 1000 VAC in 50/60 Hz for 1 minute between live parts and case  |
| Insulation resistance                               |                 | 2 M $\Omega$ or more between live parts and case (at 500 VDC by megameter)   |
| Vibration resistance                                |                 | 1.5 mm amplitude in 10 to 500Hz or acceleration of 98 m/s <sup>2</sup> , whichever is smaller for 2 hours in X, Y, Z direction each (De-energized) |
| Impact resistance                                   |                 | 980 m/s <sup>2</sup> in X, Y and Z direction, 3 times each (De-energized)  |
| Lead wire   |                 | Oil-resistant vinyl cabtire code (3 cores, $\phi 3.4$ , 5 m), Cross section: 0.2 mm <sup>2</sup> , Insulator O.D.: 1.1 mm                          |
| Mass  |                 | 250 g (including gauge and 5-m lead wire)  |
| Port size   |                 | Rc 1/8   |
| Enclosure   |                 | IP66 (Dustproof and dripproof type)  |
| Air consumption                                     | Supply pressure | 0.10 MPa   |
|   |                 | 0.15 MPa   |
|   |                 | 0.20 MPa   |
|   |                 | 16 $\ell$ /min or less   |
|   |                 | 21 $\ell$ /min or less   |
|   |                 | 25 $\ell$ /min or less   |

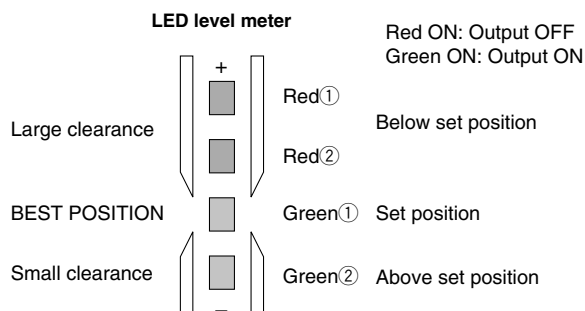
## Working Principle



In a bridge circuit as in the figure above, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1 = P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2  $\geq$  P1). Then the switch output turns on to notify that the pressure is below the detection gap.

## How to Set Pressure

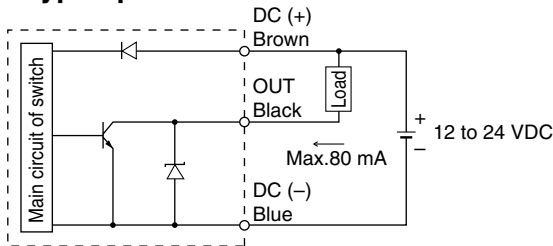
Air catch sensor is adjusted by using the LED level meter and the setting dial.



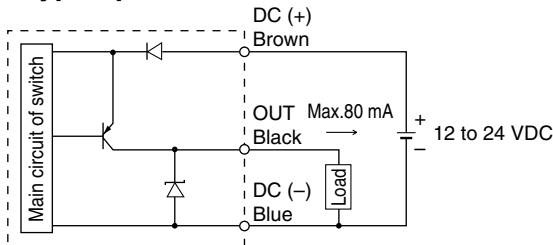
- (1) For accurate setting, create the proper setting conditions by applying a clearance gauge to the detection nozzle beforehand.
- (2) Confirm that pressure is being applied. At this time, if the setting dial is fully closed, all LEDs should be off.
- (3) Turning the setting dial in a plus direction (counterclockwise) will cause the LEDs to turn on in order: Red 1, Red 2, Green 1, Green 2.
- (4) When the Green 1 LED level meter comes on, output will be switched on, so please end the setting process at the point when Green 1 comes on.
- (5) Apply a clearance gauge to the detection nozzle once more, and confirm that Green 1 has switched on.
- (6) Hold the setting dial with a finger, and tighten the lock nut with a wrench. Tighten so that the setting dial will not turn.

## Internal Circuit and Wiring

### NPN-type open collector



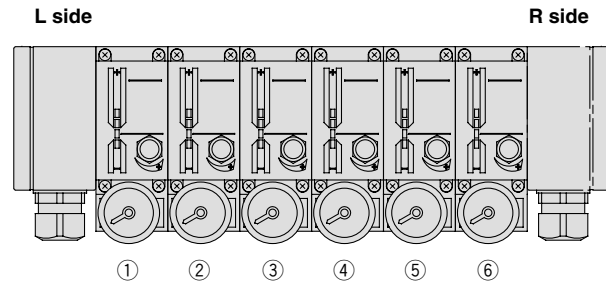
### PNP-type open collector



### Centralized wiring type

Refer to the below figure for the relation between terminal block wiring in terminal box and switch.

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| OUT<br>1 | OUT<br>2 | OUT<br>3 | OUT<br>4 | OUT<br>5 |
| GND      | VCC      | NC       | OUT<br>6 |          |



## ⚠ Specific Product Precautions

**Read before handling.**

**Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.**

### Mounting

#### ⚠ Caution

1. If the detection nozzle is exposed to splashes of water or cutting oil, do not allow backflow from the detection nozzle to the switch body. Install the switch body at a position higher than the detection nozzle wherever possible.

### Piping

#### ⚠ Caution

##### 1. Piping equipment

In the piping between the switch body and the detection nozzle, do not use equipment or fittings that can possibly cause leakage or serve as resistance.  
Do not use One-touch fittings in an environment where the air catch sensor is exposed to water or other liquid.

### Pressure Source

#### ⚠ Caution

##### 1. Supply air

Since the orifice of the air catch sensor is small, prevent foreign matter from entering the equipment. For this purpose, use supply air that is dry and filtered 5  $\mu$ m or better.

##### 2. Operating pressure

Since the product adopts a semiconductor pressure sensor, keep the operating pressure not larger than 0.2 MPa.

### Operating Environment

#### ⚠ Caution

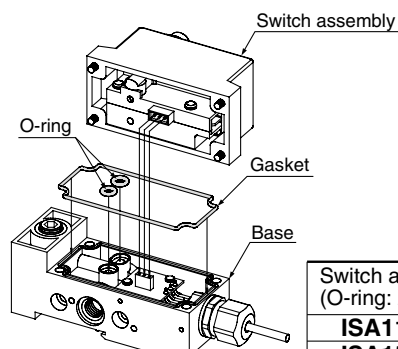
1. When an air catch sensor is contained in a box, provide an air outlet to constantly keep the atmospheric pressure inside the box. Internal pressure rises will hinder normal air discharge and may lead to possible malfunction.
2. The air catch sensor is IP66-compliant, but when there is a possibility of water, oil, etc. from the exhaust port entering the case interior, use an M5 fitting to connect a tube, and discharge air in a place where water and oil will not enter the interior. When attached with a gauge, there is a danger of materials entering the gauge interior and causing malfunction, so please remove the gauge and use a plug instead.  
When mounting a gauge to the exterior, please use piping of as short a length as possible. Failure to do so may result in slower response speed.

### Maintenance

#### ⚠ Caution

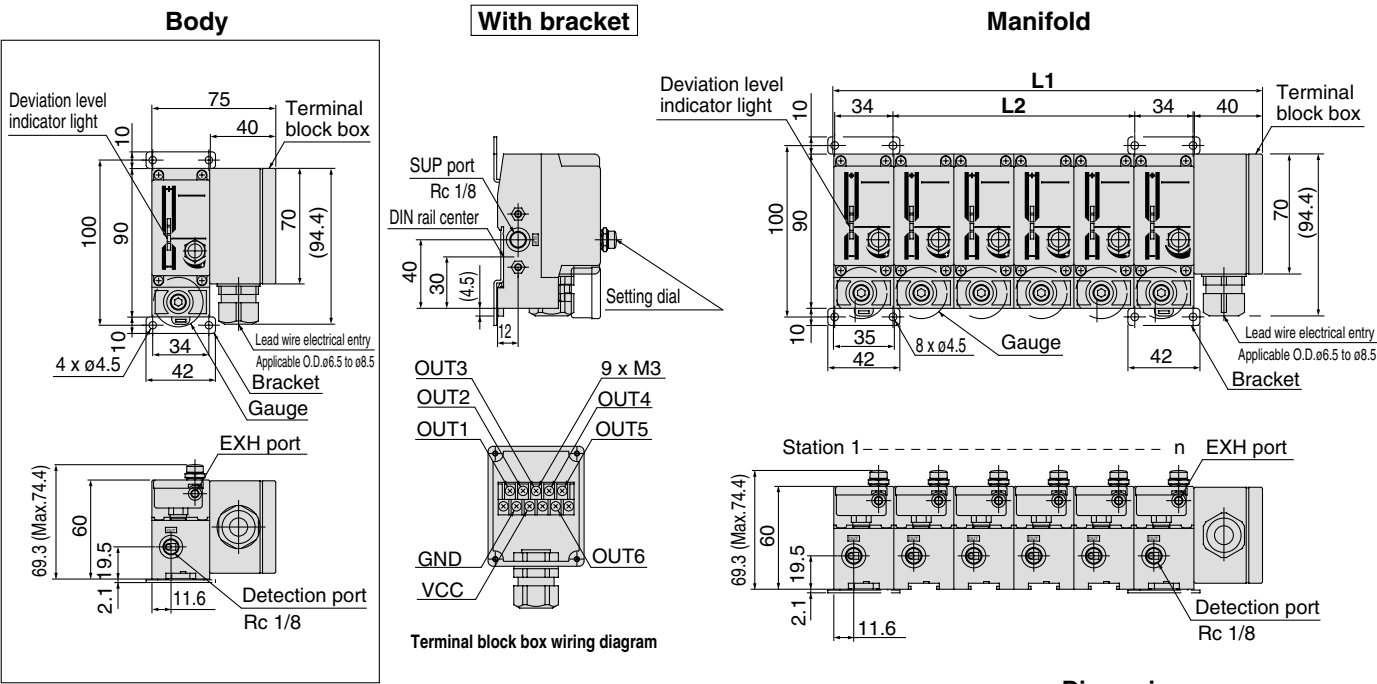
##### 1. How to change

- After loosening the four mounting screws (M4 x 8), pull straight back on the switch body. Pulling back diagonally can result in bending of the connector pin, etc., so take precautions.
- When mounting the switch body to the base, push the pin (main body side) straight into the connector (base side), and evenly mount with four mounting screws (M4 x 8). Be sure not to forget to include seals, etc. (Tightening torque 0.45 N·m)



|   |                |
|---|----------------|
| Switch assembly part no.<br>(O-ring: 2, Gasket: 1 enclosed) |                |
| <b>ISA11-0</b>  | For NPN output |
| <b>ISA15-0</b>  | For PNP output |

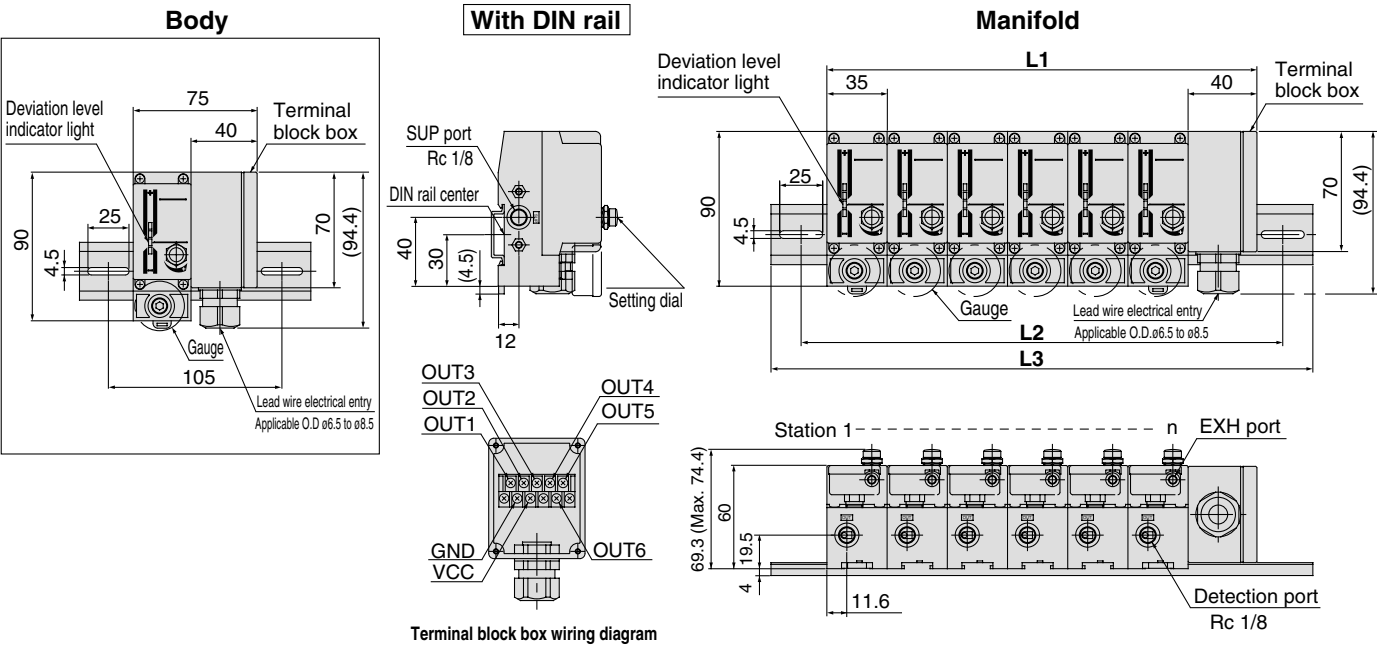
Dimensions: Centralized Wiring Type (Terminal Block Box Type)



When the bracket has two stations and the terminal block box is on the right side, it attaches to the second switch, while when it is on the left side, it attaches to the first switch. With n stations, it attaches to the first switch and the *n*th switch.

Dimensions

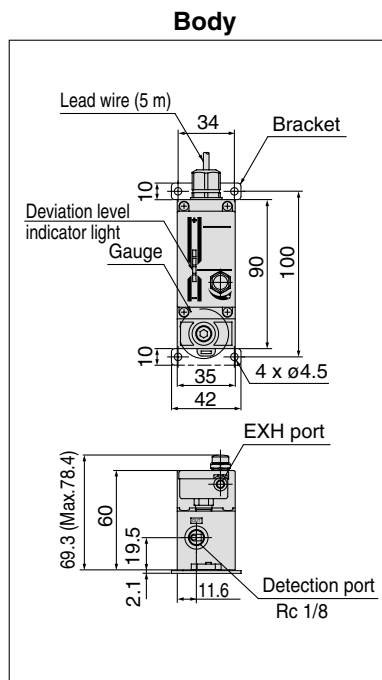
| Station | 2   | 3   | 4   | 5   | 6   |
|---------|-----|-----|-----|-----|-----|
| L1      | 110 | 145 | 180 | 215 | 250 |
| L2      | —   | 36  | 71  | 106 | 141 |



Dimensions: With DIN rail

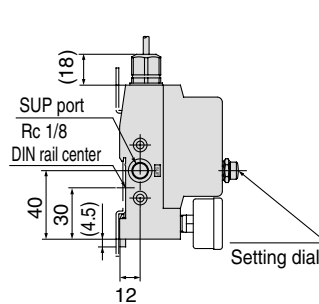
| Station | 2   | 3   | 4   | 5   | 6   |
|---------|-----|-----|-----|-----|-----|
| L1      | 110 | 145 | 180 | 215 | 250 |
| L2      | 140 | 175 | 210 | 245 | 280 |
| L3      | 175 | 210 | 245 | 280 | 315 |

## Dimensions: Individual Wiring Type (Lead Wire Type)

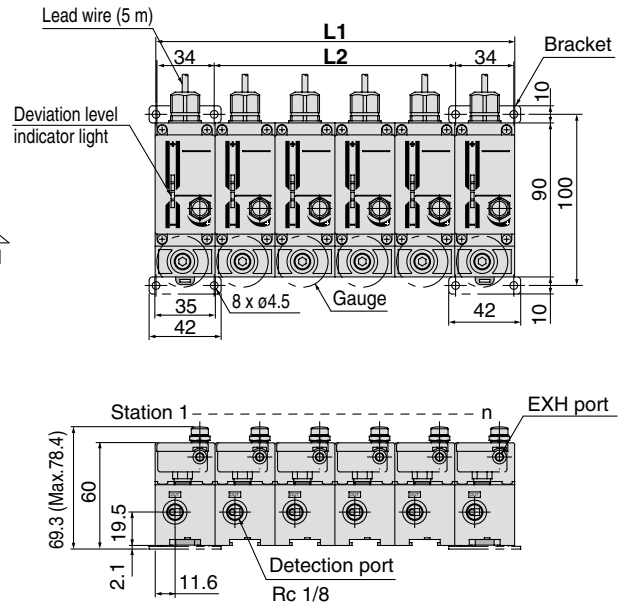


When the bracket has two stations, it attaches to the first switch.  
With  $n$  stations, it attaches to the first switch and the  $n$ th switch.

**With bracket**



**Manifold**



**Dimensions**

| Station | 2  | 3   | 4   | 5   | 6   |
|---------|----|-----|-----|-----|-----|
| L1      | 70 | 105 | 140 | 175 | 210 |
| L2      | —  | 36  | 71  | 106 | 141 |

ZSE

ISE

ZSP

PS

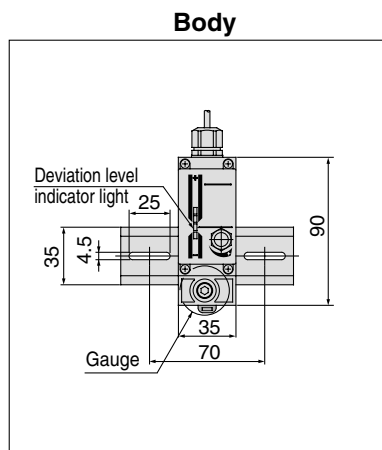
ISA

PSE

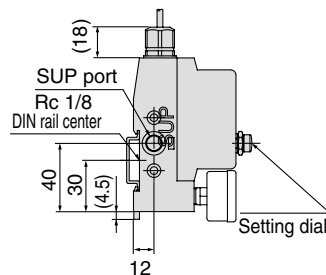
IS

ISG

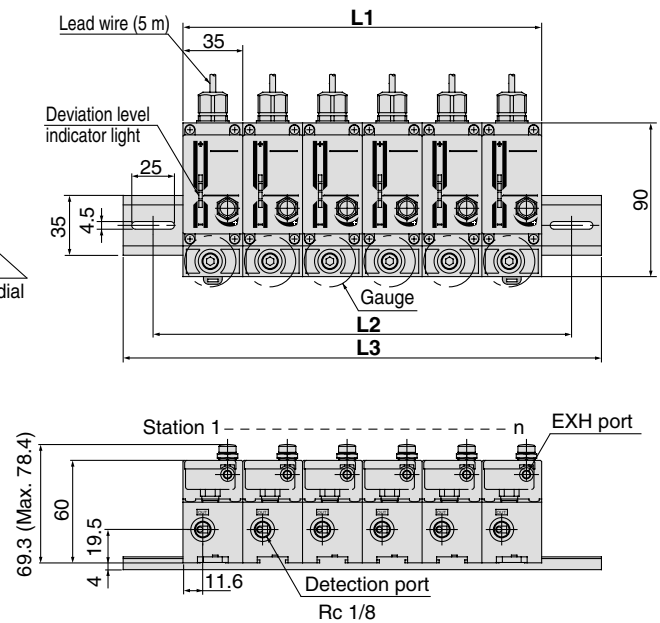
ZSM



**With DIN rail**



**Manifold**



**Dimensions: With DIN rail**

| Station | 2   | 3   | 4   | 5   | 6   |
|---------|-----|-----|-----|-----|-----|
| L1      | 70  | 105 | 140 | 175 | 210 |
| L2      | 105 | 140 | 175 | 210 | 245 |
| L3      | 140 | 175 | 210 | 245 | 280 |

## Operation guideline: Design data

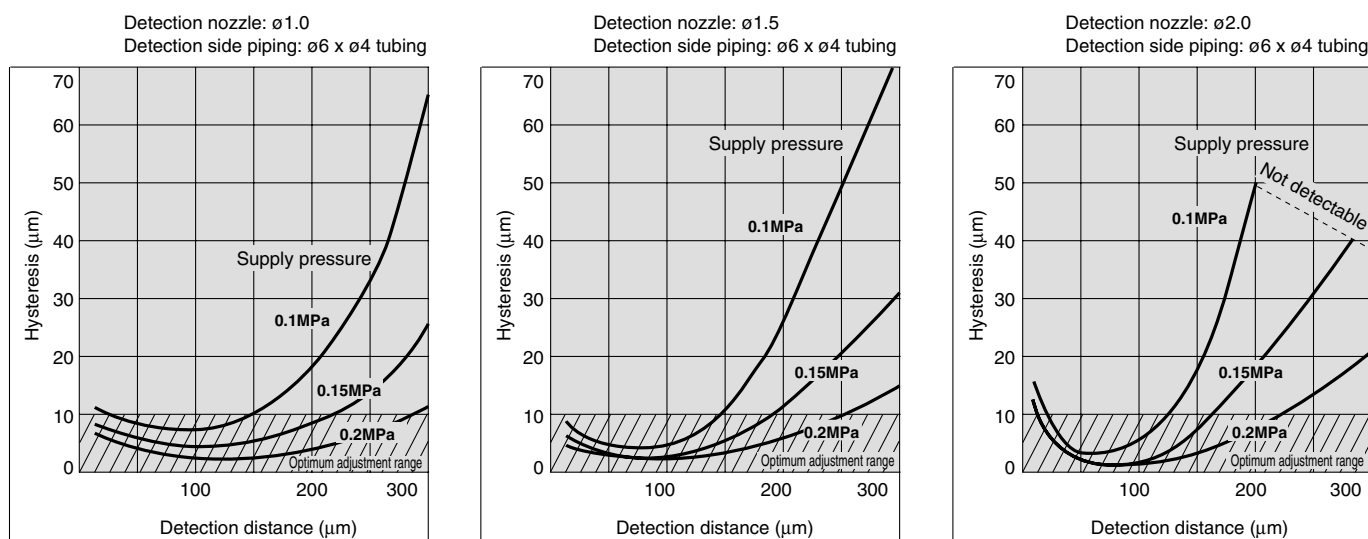
When you design the pneumatic circuit using the air catch sensor, please refer to the data below. The detection distance of the air catch sensor is between 10 and 300  $\mu\text{m}$ . However, please note that stable detection cannot be done when supply pressure or nozzle size are different.

## Relation between Nozzle Diameter and Detection Distance

The data in the following charts are characteristics of hysteresis at the detection distance.

In case accuracy is required by the settings, the design should be made so that the hysteresis will stay within the optimum adjustment range not larger than 10  $\mu\text{m}$ .

The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 10  $\mu\text{m}$ , the air catch sensor should be used to check the presence of the work piece.



Ex. 1) To detect 300  $\mu\text{m}$ , select a ø1.0 detection nozzle and supply pressure of 0.2 MPa.

Ex. 2) To detect 10  $\mu\text{m}$ , select a ø1.5 detection nozzle.

## Nozzle Shape

Please keep the nozzle shape as illustrated below.

Take every caution against chamfer on the detection surface and/or nozzle hole, which could affect the characteristics as illustrated in Figure (1).

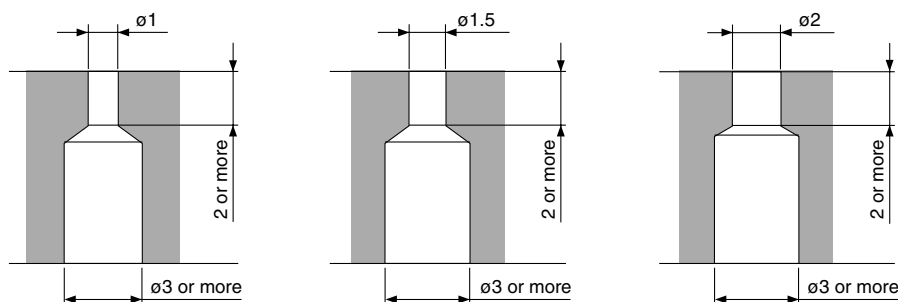
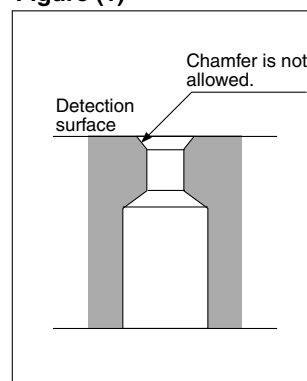


Figure (1)





## Response Time

Response time changes with detection distance and piping length. It is hardly influenced by the supply pressure and nozzle diameter ( $\phi 1.0$  to  $\phi 2.0$ ). While both graphs assume a fixed set distance with changes in the detection distance, Fig. 2 shows responses at various set values and Fig. 3 shows responses at various piping lengths. If the detection distance is equal to the set value, the response becomes quicker as the set value becomes smaller or the piping length becomes shorter.

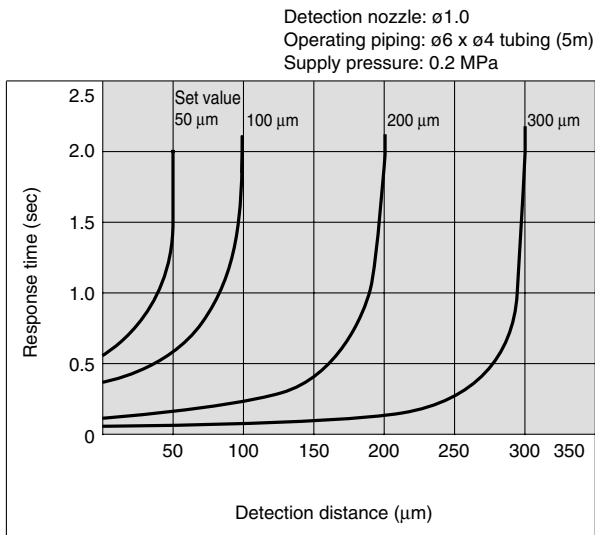


Fig. 2 Detection distance – Response time characteristics

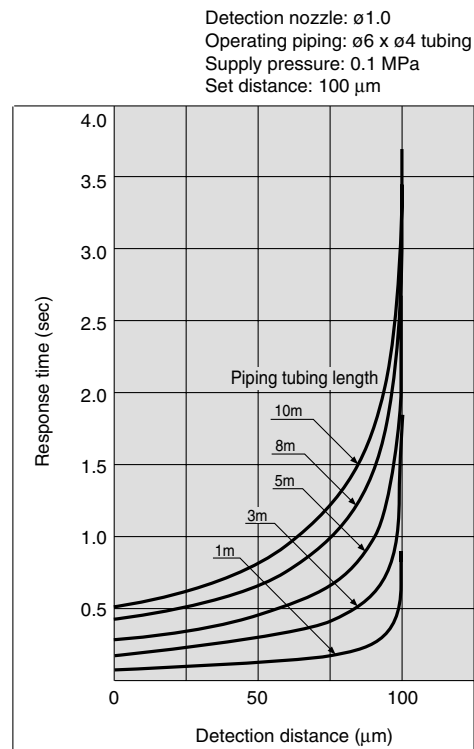
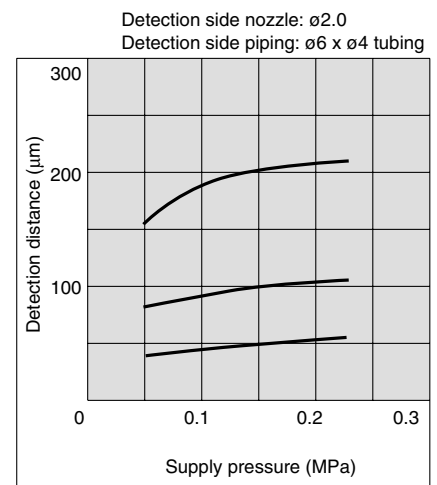
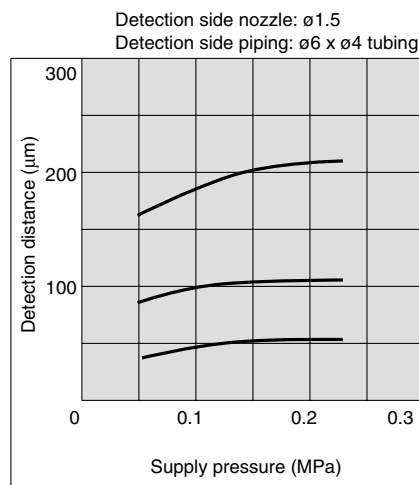
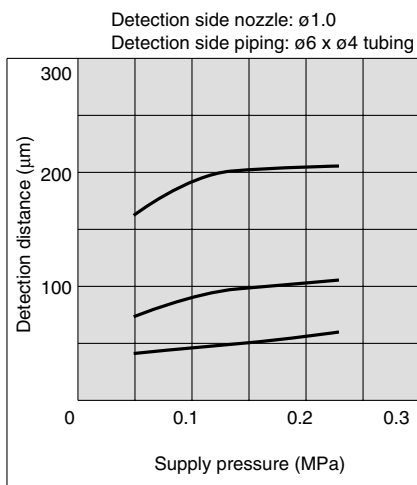


Fig. 3 Response time – Piping tubing length

## Supply Pressure Dependence

The charts illustrate changes in the detection distance with fluctuations in the supply pressure.



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ISE  
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PS  
ISA  
PSE  
IS  
ISG  
ZSM